National Institute of Standards and Technology
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TE Challenge Overview

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this week

An NC CETC paper outlined the significant **distributed resource policy issues** across the nation from third quarter 2015:

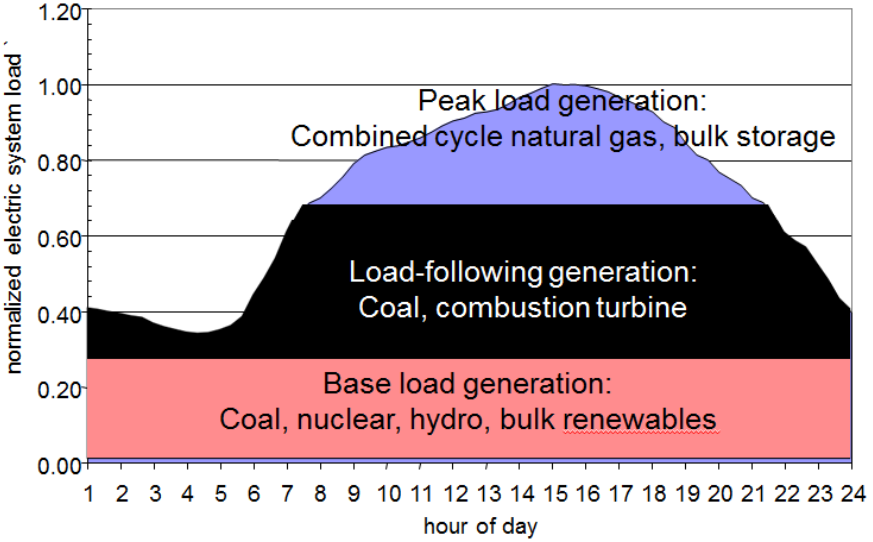
1. Expansion of utilities into rooftop solar, including initiatives in Arizona, Texas, New York and Georgia
2. **Challenges to NEM** by California IOUs that could impact the entire U.S. rooftop solar market
3. Numerous proposals from utilities for substantial **increases in residential fixed customer charges**
4. Proposals from utilities in Arizona, California, Kansas, Oklahoma, and Texas for a **demand charge for residential solar owners**
5. A proposal by NV Energy to eliminate retail rate NEM credits and impose a successor tariff that creates a new rate class for net metered customers with both **time-of-use (TOU) rates and demand charges**.

→ *TE should address most of these issues*

Smart Grid Drivers in the

Greater efficiency > reduced expansion

- Half of US coal plants (50% of
- Average substation transforme
- Smart Grid achieves greater ef delivery losses, peak-shaving tools for customers to reduce e



Increased reliability

- US power outages average 2 hours/year per customer, vs. 16 minutes in Japan
- Power outages cost the US economy $80 billion/year
- Smart Grid increase imminent failures be and support distribu

Sustainability (inte

- 29 states have in
- Smart Grid enab penetration of wi idle capacity in g of distribution sys

- Renewable energy integration
  - Capacity and stability
  - Ramping and balancing
- DER behind the meter, EVs, batteries, solar
- Distribution system flows, voltage control, constrained transformers, microgrids
- Market volatility and design
- Regulatory constraints and change
- Challenges in moving forward on TE: roadmap to implementation

What is TE?

- Transactive energy behavior is characterized by the:
  - **1) dynamic negotiation of "value" and**
  - **2) the use of that negotiated "value" as a decision making variable**
- Based on behavior, transactive energy use cases can be classified as either **Static TE or Dynamic TE**

Static Transactive Energy

- A use case contains value discovery that includes **value assessment which is not dynamically negotiated and the "value" is preset or intermittently delivered** with **discontinuous flow** of real-time value information that is not correlated with dynamic grid operational conditions
- Static TE may result in dynamic response but is not correlated with real time grid conditions or is not a continuous response to grid conditions.
- A common example would be demand response customers that decide to participate in a pre-defined utility program. They opt-in or opt-out based on a predetermined shared value. This is common practice in today's unilateral DR programs.
- Other common examples include prescheduled TOU and intermittent CPP programs.

Dynamic Transactive Energy

- A use case contains value discovery that includes **value negotiation, with dynamic "value"** and the **continuous flow** of real-time value information that is correlated with dynamic grid operational conditions and may include future information both contractual and estimated.
- Negotiation includes multi-participant markets or bilateral agreements and both human to machine and machine to machine interactions.

This is the kind of TE that we have been discussing and want to see realized

→ What part of realizing this is the TE Challenge focused on?

TE Challenge Goals

1. Develop/enhance modeling and simulation tools and platforms for TE evaluation. Advance standards interoperability and application.
2. Demonstrate how different TE approaches can improve reliability and efficiency of the electric grid to address today's grid challenges.
3. Develop a set of scenarios that can serve as ongoing reference points for modeling and simulation.
4. Develop the TE community—working together and sharing data.
5. Make progress toward successful utility TE pilots: modeling and simulation advancements as well as communications with utilities, regulators and policymakers.
6. Provide a stage for teams to present the exciting work they've accomplished—publicity.

Short version: The goal of the Challenge is to advance TE, whether that is the modeling and simulation tools, standards for use of these tools, standards for TE communications, or studies that show us how TE can work. And of course to make progress in collaboration, providing a place to do that.

How Participants will Benefit

- A collaborative process to move faster and smarter
- Help point to common gaps in knowledge, tools, techniques
- Move TE research along a path to integrate DER and enable customer load/DER to follow variable supply.
- Collaborate on simulation tools and provide simulation results as input to policy makers and regulators to help them make decisions on utility pilots and programs.
- Build collaborations with potential partners; connect with potential customers.
- Showcase tools, talent and capability; receive publicity from the Challenge.
- Receive critical review and feedback on models, tools, and TE approaches

Timeline

- TE Challenge Preparatory Workshop, Mar 24-25—demonstrated TE community agreement on the vision and need for the TE Challenge.
- June 2015: TE Challenge **website** at: http://www.nist.gov/smartgrid/techallenge.cfm
- **Kickoff Meeting** for team formation (September 10-11, 2015 at NIST)
- Interim meeting for Coordination and Team Building Meeting (December 3-4)
- **Summit Expo/Report out** (May 2016)—as part of the TE Systems Conference, May 17-19. The goal is to present the good work that has been done.
- Phase II Kickoff (and report out of ongoing project work) (September 2016)

Goals for today

- The Interim Meeting has these goals:
  - Strengthen teams (check-up on team plans and progress, refining plans and getting work done)
  - Adding new team members and new teams with interested participants who joined later (and those on the webcast)
  - Team interaction and cross-team communication